Scaring Ourselves to Death*

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Récipiendaire de la Médaille de Montréal 1984, le Dr Henry Bolker nous présente l'allocution qu'il adressait lors de la remise de ce prix qu'il méritait au Congrès CAN AM de juin 1984.

Quoique les individus des pays à économies développées vivent dans des conditions meilleures et plus longtemps grâce à la science et à la technologie, ces derniers semblent vivre continuellement dans la peur du danger et de la mort violente. La science et la technologie apparaissent comme des monstres. Pour traiter ces "monstres", le Dr Bolker va jusqu'à les réduire à l'absurdité en affirmant que la technologie n'est pas un vilain mot et que les produits de cette dernière ne sont pas obscènes pas plus que les gens qui travaillent à cette technologie ne sont pervers.

On a observé que la peur de la technologie est particulièrement un phénomène courant chez les pays développés et riches. Une fois que la société tient en haute estime le progrès technologique, elle le méprise, d'où "l'obsession technologique" et les différentes crises relevées que ce soit l'ère de l'anxiété, l'appétit des corporations, la surpopulation ou encore l'heure du jugement dernier. Ces crises atteindront un point de saturation et déclineront en intérêt pour laisser place à d'autres crises émergentes. Le public en retiendra cependant toujours quelque chose.

Le Dr Bolker termine son allocution et réclame que tout en faisant face aux crises émergentes de la technologie, nous soyons conscients de la surdramatisation deliberée et de la place des faits dans leur perspective. Ainsi, l'on pourra se laisser guider vers l'action non pas par notre peur mais par des jugements plus éclairés.

Nasty, Brutish, and Short

Over the past few years, we have all observed how certain technology-based incidents, such as those at Three Mile Island and the Love Canal, have aroused public reactions of fear and even panic. I propose to argue here that the source of the panic is not objective danger (no one living near Three Mile Island experienced any sensory signal of danger, except words). The source is a modern tendency to lose perspective of certain events, with the result that the worst effects arise from the fear itself. The ground for this tendency is well prepared by public suspicion, and hence fear, of modern science.

Some historians date the beginning of modern science at the middle of the life of Galileo, around the year 1600. Thomas Hobbes, the English philosopher, was a near contemporary of Galileo, just sufficiently younger — 24 years — for his own thinking to have been influenced by his knowledge of Galileo's methods and discoveries. Hobbes believed that in a state of nature all men are equal. Unlike many modern social critics, however, Hobbes did not deduce from his belief that a state of nature was desirable for all mankind. He reasoned that in such a state there would be no justice or injustice; there would be only war: "No arts; no letters; no society;" he wrote, "and which is worst of all, continual fear of danger and of violent death; and the life of man, solitary, poor, nasty, brutish, and short. [1]." Those last four words are Hobbes's most famous, and constitute the most concise and vivid literary description of life before the rise of modern science and technology.

In a recognizably scientific era, life in our own society should have become so much more secure than it was 350 years ago. It has certainly become much longer. Nevertheless, even in the most advanced economies, ordinary people find much to fear in the very sciences and technologies which have improved and lengthened their lives. Hence, when a potentially hazardous event occurs, it is hastily reported and somewhat sensationalized in the press, on radio, and on television, and then raised to an emotional level by the articulate "activists" among us who see evil and conspiracy in all the works of industry and government. These occurrences, poorly understood and interpreted, arouse public fear to the level of panic. In time, however, evidence emerges that, as an objective scientist might have known all along, the panic was unjustified. The source of panic lay in ignorance of science and the exploitation of pessimism and suspiciousness. Leaving aside personal family tragedy, unemployment, and the threat of war, the greatest fears of modern, western man seem to be: carcinogens in foods; nuclear power plants; pesticides; and industrial wastes. We seem to have come full circle. For, despite all the power and knowledge of the most modern societies, their inhabitants, in the words of Thomas Hobbes again, are living with "continual fear of danger and violent death."

This fear has brought us to the condition where, even with the knowledge that technology has given us better and longer lives than our ancestors, we see technology as having the face of a monster. Government decisions with costly consequences are being made, and necessary actions are being delayed for reasons that are emotional and not rational.

Science Reassures

How did our society come to regard technology with such negative emotion? After all, as the painter Georges Braque has written, "Art is meant to disturb. Science reassures" [2]. That is not how it has turned out: instead, science disturbs us, and we go to the art gallery for an hour or so of tranquillity and for the reassurance that there is continuity to life and thought.

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I am not alone in perceiving fear as the dominant social emotion in the face of technology. For example, William Ruckelshaus, the former administrator of the U.S. Environmental Protection Agency, recently published an article [3] entitled "Science, Risk, and Public Policy." The first sentence of its summary states, "A climate of fear now dominates environmental issues", and the article proper begins with the words: "We are now in a troubled and emotional period for pollution control; many communities are gripped by something approaching panic and the public discussion is dominated by personalities rather than substance." Elsewhere [4], in speaking to the Chemical Manufacturers Association of the very large expenditures that are and will be required to control very small risks Ruckelshaus said: "We are really buying freedom from fear."

Likewise, A.M. MacKinnon, president of Ciba-Geigy, has spoken [5] of scientific corporations having to do business in an "environment ... polluted by fear", and has given his explanation by saying:

> ***As chemistry has advanced, we've left a lot of people behind in the dark — alone with their fear, afraid of what they don't understand.***

Almost Panicked

The effect of "what they don't understand" was surely illustrated by the well-known incident in Niagara Falls, New York, where, in 1979, chemical vapors from an old industrial dump site were detected in the basements, but not in the living areas, of the houses in the Love Canal district. The state health commission closed a school, and recommended that children under the age of two and pregnant women be evacuated from the district. Then the state governor took action to evacuate and relocate the families from 235 houses, and the federal government declared the zone a disaster area so that the families could qualify for financial assistance. A year later, on the basis of slim and controversial evidence of chromosome damage among some of the residents, the government decided to evacuate and relocate another 710 families. It was no wonder that the president of the Love Canal Homeowners Association said at that time [6]: "People are very, very frightened, almost panicked."

The truth, however, was that after a year of investigation, no one could produce clear and rigorous evidence to prove that the residents of the district showed any excess of physical diseases beyond the range of statistical error. The only certainty was that many were suffering from a considerable assortment of psychophysiological ailments such as depression, irritability, dizziness, nausea, weakness, fatigue, insomnia, and numbness in the extremities — all ascribable to anxiety and fear.

Psychological Trauma

Making certain allowances, the situation was not much different at Three Mile Island, where the notorious reactor accident occurred in 1979, coincidentally a week after the release of the film *The China Syndrome*. Within a year many studies of the accident and its effect were in progress. One of them frankly called itself [7] "a disaster survey of a non-disaster," and it noted that although no physical damage occurred to the population or environs, the event had to be classed as a "psychological trauma".

The psychology became an issue when, in 1981, the power company wanted to resume operation of the duplicate reactor that had not been damaged in the accident. The Nuclear Regulatory Commission saw no real hazard in doing this, and was ready to permit the start-up. Neither the power company nor the commission, however, had reckoned on the intervention of an organization which called itself People Against Nuclear Energy — or PANE. PANE, living up to its name, entered a citizens' petition in a U.S. Court of Appeals, proposing that before the commission could permit the reactor to be started, it must consider the psychological stress that this action might inflict on the local populace [8]. The Court, in a two-to-one decision, granted the petition, and instructed the Agency (the Nuclear Regulatory Commission) that it must recognize the fears of local residents as one of the "environmental impacts."

Let it be said to the credit of the dissenting judge that he wrote: "The standard ... will [now] depend largely on how much fear is worked up, from whatever source, rather than how serious the danger actually is."

Those of us who still believe that the fair application of the law depends on a process of rational thought may find it reassuring that the U.S. Supreme Court, on hearing the appeal, agreed with the dissenting judge, and reversed the judgement of the lower court [9]. The Supreme Court recognized that it would be extraordinarily difficult for the government to make distinctions between genuine psychological effects and self-induced fears.

Runaway Forces

Having reviewed the examples of the Love Canal and the Three Mile Island incidents, we really should understand what they have in common: that the fear so well and extensively reported is not fear of science, but of technology. This distinction can be made only by a scientist, an engineer, or an exceptionally well-informed layman.

It has been observed before that fear of technology is peculiarly a phenomenon of the developed and affluent countries. The ordinary peasant in India, or Mexico, or Brazil has no fear of technology. He would surely welcome the relief from drudgery that technology can bring. In the developed countries most of us are so far from that drudgery, that we have little sense of how much technology has improved the quality of our lives.

In the early part of this century, the advances came in rapid succession, and the press saw only the blessings. Every discovery and invention was touted in the press with great enthusiasm. In general, society accepted the benefits of technology, and ignored the risks. In every smokestack, and in every increase in power of automobiles or airplanes, people saw the signs of progress — and assigned a high value to them. Society seemed to act on the conviction that if any problems did arise, science and technology could be counted on to neutralize them. But the society that once held technological progress in high esteem, now holds in contempt the "technological fix."

Age of Anxiety

This contempt seems to have taken root with the first stirrings of the environmental movement, just after World War II. The earliest environmentalists were likely those scientists who first perceived that nuclear weapons represented a threat to the whole human race. In 1947, J. Robert Oppenheimer expressed their collective feeling by saying, "The physicists have known sin."

It was just then, when people thought that the catchword for our time was to be the Atomic Age, that W.H. Auden, with his poetic insight, wrote and published "The Age of Anxiety" — an epithet far more suited to all the years since.

It was also just then that the Federation of Atomic Scientists began to publish its "Bulletin", with a chilling cover that always bore the Doomsday Clock showing the number of minutes left to midnight -- midnight being the metaphor for the end of mankind.

In 1947, the clock showed twelve fifty-three, and was meant to be a prophecy that unless someone or something stopped the works, the hands would soon move inexorably to midnight. In 1983, the clock stood at three minutes to midnight: according to the Bulletin, we have moved 57 per cent closer to doomsday.

Before we panic, however, let us be cheered by the optimistic observation that the Doomsday Clock has long since lost its credibility. A metaphor should be consistent with reality, and, since time can only move forward, so should the Doomsday Clock. Nevertheless, in its 36 years of existence, the Doomsday Clock has moved backward as well as forward.

The Clock, then, does not tell us how things will be. It only tells us how a certain group of people think things are now. The same may be true of the prophecies of all the so-called "futurologists" who became so prominent in the 1970s.

A Hole in the Carpet

Whatever its shortcomings as a source of valid prophecy, the early anti-nuclear movement, led at first by scientists, established the intellectual style of the succession of anti-anything movements that were to follow. By about 1960, that early anti-nuclear movement showed signs of having run its course. Even the hands of the Doomsday Clock, which had advanced during the 1950s, had fallen back again to seven minutes to midnight. The time was ripe for the environmental movement to find a change in direction. That change was foreshadowed in 1960 with the publication of *The Wastemakers* by the journalist Vance Packard [10]. The real turning point, however, came in 1962, when Rachel Carson published *Silent Spring* [11]. This book gave the "antis" some new targets to attack. It also had a lastingly insidious influence in giving legitimacy to the style, already seen in the Doomsday Clock, of calculated overdramatization. This is the same technique as was used by an advertising agency to sell a digestive tablet: "There's enough acid in your stomach to burn a hole in the carpet." Any chemist can pick out the fallacies in that sentence, but a layman will find it alarming. Nevertheless, it well represents the style that has become part of the technique of all environmental and consumer movements, and that has the tragic effect of obscuring the truth from those who need it most.

By the early 1960s, Barry Commoner had already published *Science and Survival* [12], and Jacques Ellul had launched the modern literature of antitechnology with a book called *The Technological Society* [13]. Ten years later this trend reached its culmination in Theodore Roszak's *Where the Wasteland Ends* [14] and E.F. Schumacher's *Small is Beautiful* [15].

Hundreds of Millions

In 1968, midway between the contributions of Rachel Carson and E.F. Schumacher, and just as American participation in the Vietnam war was reaching its peak, another dimension was added to the environmental cause with the publication of Paul R. Erlich's *The Population Bomb* [16]. This book skillfully carried on in the Rachel Carson tradition of calculated overdramatization. "The battle to feed all of humanity is over," Erlich wrote. "In the 1970s the world will undergo famines, and hundreds of millions of people are going to starve to death in spite of any crash program embarked on now." Looking back on the 1970s, we know that this did not happen on the scale that Erlich predicted. A famine did occur in a very limited part of the world, and it had been easy to predict in 1968, because, although little known at the time, a drought had already begun in the Sahel region of Africa. Severe and tragic famine struck in 1973-74. The tragedy may have been magnified because it took place in countries that had been independent since only 1960, and even now have literacy rates of 10–15% and annual per capita income of $150–400. That famine since seems to have been brought under control, although we have been witnessing an intense manifestation of it in Ethiopia. Nevertheless, Erlich's overdramatized prophecy of "hundreds of millions" starving to death in the 1970s, was not fulfilled, but when it was made it did focus a lot of attention on him and on the ideas that he advocated.

Corporate Greed

The starving people of the Sahel no doubt welcomed any food that was sent to them from Europe and America. The environmentalists and consumerists tell us, however, that the North American food industry has no scruples about poisoning us all. In 1970, the Ralph Nader organization published *The Chemical Feast* [17]. This book condemned government and industry together. It blamed the U.S. Food and Drug Administration for not being an effective counterweight against the "corporate greed and irresponsibility" of the $125 billion food industry. The industry, it said, is more interested in maximizing profits than in providing safe and nutritious food.

The theme of "corporate greed and irresponsibility" is a common one in the environmental and consumer movements. Most of the people in these movements genuinely care about the fate of the environment, the rights of consumers, and the kind of future we shall leave for our descendants. Nevertheless, it is no secret that left-wing political activists have played a visible role in the environmental movement, and expressions like "corporate greed and irresponsibility" are part of their rhetoric.

Those who use such rhetoric tend to imply that if we had a "People's Government," with no corporations, pollution would not be a problem. They imply that in well-run countries, like the Soviet Union and China, pollution has *never* been a problem.

The irony is that this is not true. The industrialization of the Soviet Union has taken place with the same innocent ignorance of environmental effects, and the same intensive use of natural resources as has occurred in the West.

In the early years of the Soviet Union its government placed heavy emphasis on growth and productivity. It considered making use of natural resources to be more important than conserving them [18]. In that respect, we may note with wry amusement, early Soviet policies were not different from the policies of the last decades of Tsarism. Conservation slowly began in the 1950s, but the first public evidence that a new awareness had arisen of the need for environmental protection did not emerge until 1971, when Brezhnev spoke of it at the Twenty-Fourth Party Congress. The present consensus of informed Western observers [19,20] is that the Soviets may point to recent achievements in this field, but they, like us, have only been cleaning up the mess of previous generations.

Despite new laws, new budgets, and an emphasis on resource conservation, there have been some gains in the past ten years, but the situation has not changed much [21]. Air pollution is very serious in major cities, and Lake Baikal, the Sea of Azov, and the Caspian Sea are still being polluted. The early adverse publicity that emanated from the situation at Lake Baikal has led to a tightening of censorship on environmental information. This is the same cover-up approach as that taken in the Soviet Union to accidents at nuclear power plants [22].

The situation in China is said to be different only in kind. At least one reliable scholarly observer has reported [23] that

Chinese government policies in both agriculture and industry have resulted in massive pollution of land, air, and water, and to the considerable destruction of natural resources. Cities are polluted because great quantities of coal are burned there. Rivers are polluted because ninety per cent of urban sewage is not treated. Ill-advised land-use policies have resulted in extensive soil erosion and flooding. In Manchuria, excessive use of pesticides on crops has resulted in dangerous levels having been found in grains, vegetables, and meats.

What a surprise it must be to those who believe they do it better in the Socialist East, where not one private corporation is to be found, to learn that food contaminated with pesticides is harvested and distributed there.

In any event, I am beginning to form the impression that our own panic over pesticides and additives in food is completely out of proportion to reality. Evidence is accumulating that the quantities of additives and pesticides are trivial compared to the quantities of mutagenic and carcinogenic compounds that are normal components of many foods.

Carcinogens in Every Meal

It was twenty years ago that benzo(a)pyrene and other polynuclear hydrocarbons were found in charcoal-broiled meat [24]. In the paper which reported this finding, the authors quietly commented that the quantity of benzo(a)pyrene found in a single steak was about the same as that measured in the smoke of 600 cigarettes. When I first read that, in 1964, I wondered how long it would take before all the suburban backyard barbecues would make their way to the garbage heap. But it never happened, presumably for the same human reason that people living in or near an active volcano do not like to move away.

The barbecues did not go to the scrapheap even in 1978 when Barry Commoner and his colleagues reported in a well publicized paper [25] that extracts of ground beef cooked in a hamburger maker contained substances that tested positively as mutagens in the Ames Salmonella test.

Switching from meat to fish is no way to sidestep possible hazards. Broiled fish (sardines) has been found [26] to contain a goodly quantity of 2-amino-3-methyl-3H-imidazo[4-5-f]-quinoline — described as a potent mutagen.

These findings might drive one to drink, except that the known carcinogen N-nitrosodimethylamine has been found in six out of seven brands of scotch, and in eighteen brands of beer [27]. One could risk drinking wine, sherry, liqueur, brandy, gin, vodka, or rum, because the compound was not found in them. There is no guarantee, however, that other hazardous compounds will not be found in them next year.*

What should be troubling, but somehow doesn't seem to be, is that many compounds that would be banned as additives have been found to be natural components of raw foodstuffs. The same Bruce Ames who developed the Salmonella test for mutagenicity reviewed this subject last year [28]. At first reading, I thought his paper might be a satire, but it was not. He was serious, and it is true that (in Ames's words):

> ***There are large numbers of mutagens and carcinogens in every meal, all perfectly natural and traditional. Nature is not benign. It should be emphasized that no human diet can be entirely free of mutagens and carcinogens and that the foods mentioned are only representative examples.***

The foods mentioned included: black pepper, which contains safrole; certain mushrooms containing hydrazines; certain other mushrooms containing a diazonium derivative of agaritine; figs, parsley, parsnips, and celery, with their high psoralen content; potatoes, which contain solanine, chaconine and other glycoalkaloids at about one-third the known lethal level (the level increases when the potatoes are diseased, bruised, or exposed to light); rhubarb, cocoa, broadbeans, mustard, horseradish, cottonseed oil, alcohol, food molds, all with their own effects. Each 100-gram portion of vegetables such as beets, celery, lettuce, spinach, radishes, and rhubarb contains about 200 milligrams of nitrite.

I have already listed certain cooked foods, but I have not yet mentioned the known effects of fats, caramelized sugars, and coffee.

In summing up, Ames cited the common estimate that the daily human dietary intake of man-made pesticides is between 60 and 150 micrograms, and noted that this is only about one ten-thousandth of our daily consumption of nature's pesticides which is of the order of several hundred grams per day.

All of this sounds hopeless and distressing, but Ames has also pointed out that we have defense mechanisms to protect ourselves against mutagens and carcinogens. One of them is the continuous shedding of the surface layer of the skin, cornea, stomach, intestines, and colon. Another seems to be the presence of certain antioxidants in our diets and in our bodies. There is a theory developing that carcinogenesis occurs not through the simple action of a carcinogen, but through an upset in the balance of carcinogens and anticarcinogens in the body. As T.H. Jukes has pointed out [29], it is not reasonable to believe that some evolutionary process has given human beings the ability to cope with injurious substances in common foods, but that these same mechanisms are likely to find a "new" chemical unmanageable.

If we really want a reason to ban a particular food, perhaps we should consider the information about hot dogs that was published recently in the newspaper [30]. Hot dogs, it seems, are more likely than any other food to choke children to death. I rather doubt that this hot-dog story, or the hamburger story I cited earlier had any effect on anyone's food habits. Hot dogs and hamburgers are too familiar as foods to be thought of as dangerous.

Issue-of-the-Year Club

Nevertheless, we do know that stories about chemicals and nuclear energy can have a terrifying effect, and that such stories seem to appear with disheartening regularity. This happens because [31] the nature of modern news media is such that although they concentrate — even overconcentrate — on particular topics, their attention span is too short for achieving balanced coverage. Instead, they seem to present the affairs of the world as a series of crises, each crisis taken up, built to a climax, publicized until boredom becomes imminent, and then dropped in favor of the next crisis.

A columnist in *The Wall Street Journal* [32] saw in this phenomenon reason to wonder if "some issue-of-the-year club were in charge" of North American society. "A problem emerges suddenly," he wrote, "builds swiftly to crisis proportions, briefly dominates public consciousness and concern, and then abruptly fades from view. Civil rights, urban decay, hunger, drugs, crime, campus unrest, medical care, the environment, energy — one succeeds another with blinding speed." Reading this, we see that this sequence applies just as much to the reporting of events in politics, as to the reporting of events in science and technology.

The journalist I have cited was, of course, writing of the United States, but the same is true in Canada. The only difference is that in Canada the crises generally rise to the surface some six to twelve months later. Another writer [33] has estimated that new crises appear in the media about every two years. Since they usually overlap, the average lifetimes of major crises seem to range between three and five years.

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* Since this was written they have indeed been found in wine.

We Are All Afraid

Now, although I have been sarcastic about publicity-generated crises, and although I have been deprecatory about certain aspects of the environmental movement, it is not to be concluded that they should be ignored. They may have raised many false spectres, but they have uncovered enough truths to have performed useful services in society. Each new crisis generates a great deal of political action, and the crisis reaches a peak. Sooner or later a point of saturation is reached, and public interest begins to decline. (Backlash may contribute to the decline, but more likely what occurs is displacement by a new emerging crisis.) The good part is that despite the decline, all interest is not lost forever. As often as not some new structures — social, governmental, industrial, or academic — are left behind to deal with the problem in a gradual, patient, and realistic way.

The late Jacob Bronowski said it well[34]: "We are all afraid — for our confidence, for the future, for the world. That is the nature of the human imagination. Yet every man, every civilization, has gone forward because of its engagement with what it has set itself to do."

My target here is not those crises that lead to positive and constructive action. My plea is that, in dealing with crises arising from technology, we be conscious of calculated over-dramatization, place the known facts in perspective, and let them, not our fears, be our guide to action. If the end of mankind is to come, let it not come by our having scared ourselves to death.

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